AMENDMENTS TO THE CLAIMS

Kindly add newly presented claims **30-38** as shown in the listing of claims below. This listing of claims will replace all prior versions, and listings of claims in the application.

LISITING OF CLAIMS

Claim 1. (original). A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:
a first layer, said first layer defining a fiber socket formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;
a second layer bonded to said first layer;
said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said fiber socket aligning and positioning said optical fiber therein; and wherein said second layer has an index of refraction substantially equal to the index of refraction of the core of said optical fiber.

Claim 2. (original) The optical fiber coupler of claim 1 wherein said optical fiber comprises a single mode optical fiber.

Claim 3. (original) The optical fiber coupler of claim 1 wherein said first layer comprises substantially single-crystal silicon.

Claim 4. (original) The optical fiber coupler of claim 1 wherein said second layer comprises silicon.

Claim 5. (original) The optical fiber coupler of claim 1 wherein said second layer comprises glass.

Claim 6. (original) A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:
a first layer, said first layer defining a fiber socket formed by photolithographic masking and

etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;

a second layer bonded to said first layer;

said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said fiber socket aligning and positioning said optical fiber therein; and

an epoxy that fills the gap between the end face of the optical fiber and the adjacent portion of the second layer, said epoxy having an index of refraction that approximately matches the index of the optical fiber so that optical losses are reduced.

Claim 7. (original) A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:

a first layer, said first layer defining a fiber socket formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;

a second layer bonded to said first layer;

said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said fiber socket aligning and positioning said optical fiber therein; and

an optical device integrated into said second layer.

Claim 8. (original) The optical fiber coupler of claim 7 wherein said optical device comprises a VCSEL to provide an integrated fiber optic transmitter.

Claim 9. (original) The optical fiber coupler of claim 7 wherein said optical device comprises a photodetector to provide an integrated fiber optic receiver.

Claim 10. (original) A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:

a first layer, said first layer defining a fiber socket formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;

a second layer bonded to said first layer, wherein said second layer comprises an optical focusing element arranged to couple optical radiation with said optical fiber;

said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said fiber socket aligning and positioning said optical fiber therein; and

wherein said optical focusing element comprises a gradient-index lens.

Claim 11. (original) The optical fiber coupler of claim 10 wherein said optical focusing element has a focal point for optical radiation from the optical device, said optical fiber includes a core and a cladding surrounding said core, and said focal point is approximately situated along the central axis of said fiber socket, so that the optical radiation is coupled into said core of said optical fiber.

Claim 12. (original) The optical fiber coupler of claim 11 wherein said optical fiber comprises a single mode fiber.

Claim 13. (original) A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:

a first layer, said first layer defining a fiber socket formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;

a second layer bonded to said first layer, wherein said second layer comprises an optical focusing element arranged to couple optical radiation with said optical fiber;

said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said fiber socket aligning and positioning said optical fiber therein; and

wherein said optical focusing element comprises a diffractive lens.

Claim 14. (original) A multilayer optical fiber coupler for coupling optical radiation between an optical device and an optical fiber, comprising:

a first layer, said first layer defining a fiber socket formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align said optical fiber therein;

a second layer bonded to said first layer;

said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer, said

fiber socket aligning and positioning said optical fiber therein; and

a third layer bonded to said second layer, said third layer comprising an optical device.

Claim 15. (original) The optical fiber coupler of claim 14 wherein said optical device comprises a VCSEL.

Claim 16. (original) The optical fiber coupler of claim 14 wherein said second layer comprises an optical focusing element.

Claim 17. (original) The optical fiber coupler of claim 14 wherein said third layer comprises an optical focusing element.

Claim 18. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets;

forming a plurality of VCSELs in said second layer in a predetermined configuration corresponding to the configuration of said fiber sockets; and

aligning said first layer with said second layer so that said VCSELs are aligned with said fiber sockets, and then performing said step of bonding said first and second layers together to provide said composite wafer.

Claim 19. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets;

forming a plurality of photodetectors in said second layer in a predetermined configuration corresponding to the configuration of said fiber sockets; and

aligning said first layer with said second layer so that said photodetectors are aligned with said fiber sockets, and then performing said step of bonding said first and second layers together to provide said composite wafer.

Claim 20. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets;

forming a plurality of optical focusing elements in said second layer in a predetermined configuration corresponding to the configuration of said fiber sockets; and

aligning said first layer with said second layer so that said optical focusing elements are aligned with said fiber sockets, and then performing said step of bonding said first and second layers together to provide said composite wafer.

Claim 21. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber

sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of forming said plurality of optical focusing elements comprises forming refractive lenses.

Claim 22. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of forming said plurality of optical focusing elements comprises forming diffractive lenses.

Claim 23. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of forming said plurality of optical focusing elements comprises forming gradient-index lenses.

Claim 24. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes

through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said second layer comprises an optical material that has an index of refraction substantially equal to the index of refraction of said optical fiber, and said step of affixing said optical fibers into said fiber sockets includes applying an epoxy that approximately matches the index of refraction of said optical fiber into the fiber sockets to fill the gap between adjacent sections of said second layer and said optical fiber.

Claim 25. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of bonding said first and second layers comprises anodic bonding.

Claim 26. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber

sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of bonding said first and second layers comprises epoxy bonding.

Claim 27. (original). A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said step of bonding said first and second layers comprises metal solder bonding.

Claim 28. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:

photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;

bonding said first layer to a second layer together to provide a composite wafer;

dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;

affixing optical fibers into said fiber sockets; and

wherein said dicing step comprises cutting partially through said composite wafer, then performing said affixing step to affix optical fibers to said fiber sockets, and then physically separating said composite wafer into chips, each of which comprises one or more optical couplers.

Claim 29. (original) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:
photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber;
bonding said first layer to a second layer together to provide a composite wafer;
dicing said composite wafer into a plurality of chips, each chip including one or more fiber sockets;
affixing optical fibers into said fiber sockets; and
bonding a third layer that comprises an optical device to said second layer.

Claim 30. (new) A multilayer optical fiber coupler, comprising:
a first layer, said first layer having one or more fiber sockets formed by photolithographic masking and etching to extend through said first layer, said fiber socket sized to receive and align an optical fiber therein.

Claim 31. (new) The optical fiber coupler of claim 30 wherein said one or more fiber sockets include two or more fiber sockets.

Claim 32. (new) The optical fiber coupler of claim 30, further comprising a second layer affixed to said first layer.

Claim 33. (new) The optical fiber coupler of claim 32 wherein said optical fiber has an end section that extends through said fiber socket.

Claim 34. (new) A method for making a plurality of monolithic optical fiber couplers that align an optical fiber that have a predetermined diameter, comprising:
photolithographically masking and etching a first layer to form a plurality of through holes through the first layer, thereby forming a plurality of cylindrical fiber sockets in a predetermined configuration, said fiber sockets having a diameter approximately equal to the diameter of the optical fiber.

Claim 35. (new) The method of claim 34, further comprising affixing optical fibers into said fiber sockets.

Claim 36. (new) The method of claim 34, further comprising dicing said first layer into a plurality of chips, said chip including one or more fiber sockets.

Claim 37. (new) The method of claim 34, further comprising affixing said first layer to a second layer together to provide a composite wafer.

Claim 38. (new) The method of claim 37, further comprising dicing said composite wafer into a plurality of chips, said chip including one or more fiber sockets.